A DAY AT THE DUNES

AN ACTIVITY GUIDE FOR TEACHERS TO LEAD
A SELF-GUIDED HIKE AT
INDIANA DUNES NATIONAL LAKESHORE

ACKNOWLEDGEMENTS

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FOR MORE INFORMATION:

To learn more about Indiana Dunes National Lakeshore, visit our website at www.nps.gov/indu . For a copy of this or other educational materials visit www.nps.gov/indu/education.

For more information about other environmental education resources in the area, explore the Environmental Educators Network website: www.eeintheregion.org.

HERE ARE SOME REASONS WHY & HOW YOU SHOULD USE THIS GUIDE

Everyone loves the Indiana Dunes, and we want you and your students to enjoy this resource and experience it in a meaningful way. The staff at Indiana Dunes conduct a variety of ranger-led programs throughout the year and are able to meet many students. There will never be enough rangers, though, to meet the demand of schools in this region. Therefore, this booklet can assist teachers in preparing for and implementing a field trip experience to the dunes on their own. In conjunction with providing programs, the park rangers are trying to balance letting people visit the dunes and also preserving them unimpaired for future generations. The suggestions in this guide will also enable educators to assist the National Park Service in preserving this unique place for future students.

STEPS TO IMPLEMENT A SELF-GUIDED VISIT TO INDIANA DUNES:

1. Please read the entire activity guide carefully and take special note of the suggestions for protecting the resources.
2. **Contact the national lakeshore's scheduling office at (219)-395-1857 at least three weeks prior to your visit to let the staff know of your visit**. During the spring and summer months, a fee is charged to enter West Beach. However, educational groups who have scheduled their field trips can request a fee waiver from the Chief Rangers Office. Instructions are on our website: http://www.nps.gov/indu/forteachers/planafieldtrip.htm
3. Conduct classroom activities to prepare students for the visit. Section one of this guide provides fun pre-visit activities that will increase the students' knowledge about adaptations, habitats, communities, and Indiana Dunes National Lakeshore. All the materials for this section are provided for you to photocopy.
4. Prepare for the field trip. West Beach is the site used in this activity guide. You are not limited to that area of the park, though. Many of the activities included in this packet can be adapted to other areas of the park. We want you to feel comfortable leading your students on the West Beach Succession Trail. Section two has background information about the plant and animal communities that you will visit. This is the same information a new park ranger receives to guide this hike. The only things you need for your park visit are 4 by 6 index cards, a bus, and to arrange a fee waiver to West Beach.. If you want to be better prepared to teach succession, we recommend reading *Dune Country* by Glenda Daniel. It is sold at the Kemil Road Visitor Center.
5. Conduct classroom activities after the field visit to follow up and incorporate the experiences into your overall curriculum. Section three introduces the students to some critical resource issues for which rangers and scientist are trying to find solutions. Your students will need to use critical thinking to suggest solutions to some of the threats to the park that are presented in the post-visit section. They will also learn that many problems do not have a solution and it will be difficult to pass this park on to future generations unimpaired. You need a photocopier and 150 tokens to do all the activities in section three.

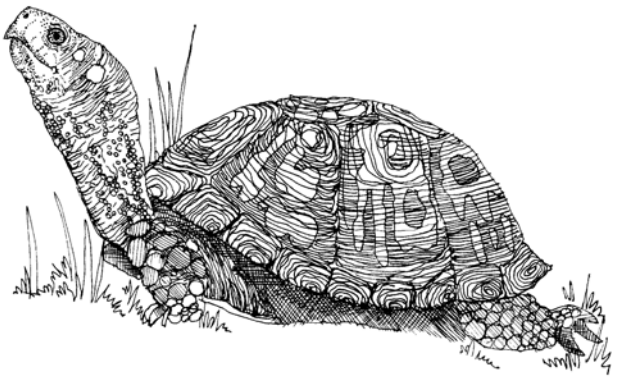
HELP YOUR STUDENTS LEARN MORE ABOUT INDIANA DUNES NATIONAL LAKESHORE

SECTION ONE

TO INCREASE YOUR STUDENTS' KNOWLEDGE ABOUT ADAPTATIONS, HABITATS AND COMMUNITIES,

DO THESE ACTIVITIES IN YOUR CLASSROOM BEFORE VISITING INDIANA DUNES.

WIN, LOSE OR ADAPT



Play this fun game to help reinforce the concept of adaptations. Start by reading the following information to the students.

It is springtime at Indiana Dunes, and a Red-tailed Hawk circles high above in the sky. Scanning the ground he sees some suitable nesting material. When he lands, he takes out his tape measure, marks a line on the branch and saws it in half. The hawk carries the branch up high into a tree where he nails it down to make the platform for his nest.

Sound strange, how about this? It's almost dinnertime and your mother jumps out the window and begins to fly above a meadow. Using her extreme eyesight, which equals a seven power binocular, she spots a rodent in the grass. She swoops down and catches the mouse with her feet. Happily she flies back to the kitchen and serves you dinner.

You know your mom cannot fly and hawks do not use a hammer and nails. However, hawks are born with many adaptations that help them survive. You could name many of them right now. For example, a hawk has wings to fly; sharp claws called talons; eyesight equal to a pair of seven-power binoculars; and a sharp, curved beak to tear meat.

Remember this, an adaptation is a special part of a plant or animal that helps it survive.
Try this test to show the importance of one of your adaptations. Place your thumb across your palm. Try to untie your shoelaces and retie them without using your thumbs.

This game is played like the old TV show, Win, Lose, or Draw. Photocopy the copycat pages and cut each line into a slip. Make two teams. Designate a timekeeper. Start by having one student pick a slip with an organism and its adaptation.

At the start, the student should draw until his or her team guesses the animal. Students must draw and not act out the word or point to an object. They are allowed to write the name of the animal on the board after it has been guessed. Continue to draw until the adaptation is mentioned. Make a time limit of 180 seconds. The team with the lowest score wins.

After the team guesses the animal and the adaptation, have the students explain how the adaptation helps the animal or plant survive.

COPYCAT PAGE * WIN, LOSE OR ADAPT CARDS

DEER – HOOF

BAT – SONAR

SKUNK – SMELL

GRASSHOPPER – ANTENNA

FOX – TEETH

VULTURE – BALD HEAD

HUMMINGBIRD - LONG TONGUE

FROG – HOPPING LEGS

CATTAIL – PARACHUTE SEEDS

RATTLESNAKE – FANGS

GREAT BLUE HERON – LONG LEGS

HAWK – HOOKED BEAK

TURTLE – SHELL

EAGLE – TALONS

OAK – ACORN

DUCK – WEBBED FEET

RACCOON – PAWS

RED-WINGED BLACKBIRD – WINGS

BASS – FINS

SQUIRREL – LONG TAIL

BEAVER – FLAT TAIL

POISON IVY – POISONOUS OIL

BLUEBERRY BUSH – BERRIES

HORNET – STINGER

PINE – NEEDLES

OWL – EYES

CARDINAL – SONG

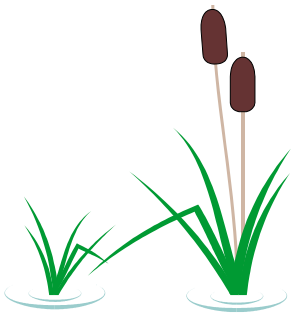
COYOTE – NOSE

WILD ROSE – THORNS

CATERPILLAR - CAMOUFLAGE

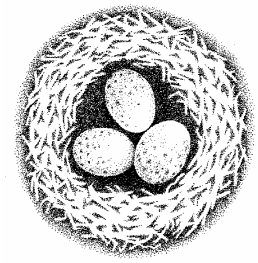
HOGNOSE SNAKE – PLAYS DEAD

REDWING TERRITORY



Singing from the top of a cattail, a Red-winged Blackbird announces it will defend the space it needs to find food and build its nest. Introduce the concept of habitat chant and then read the story about Redwings and their territorial behavior to the students.

Habitat Chant - All plants and animals have four basic requirements that their habitat needs to supply. Students remember this chant; "Food, water, shelter, and space, habitat is a wonderful place." The following activity will help students understand the habitat requirements of the most common songbird in North America, the red-winged blackbird.



At the end of February there is still ice on the pond as a park ranger leads a group of students to a cattail marsh. With a loud call, a red-winged blackbird offers his disapproval to the approaching group. "It one of the first signs of spring," the ranger tells the students. "The red winged blackbirds are usually the first songbirds to return from the south. Even though there are freezing temperatures and it still might snow, we will be seeing robins and bluebirds soon."

Male redwings return to the marshes in Indiana Dunes to claim a territory, to build a nest and to find food. The students watch the aerial combat going on above the cattails. Two males are chasing each other. It all started when one male flew too close to the space defended by another. After the battle, both males return to a tall cattail in their territory and announce their dominance by singing. The song is used to announce their presence in the territory they are defending. Rarely are any birds hurt during these battles.

In every community the pattern is the same for most birds. The male arrives to find a territory. Stronger males usually get a territory with more food and a good nesting area.

Each species of bird has its own habitat requirements. Ducks need a pond, bluebirds defend a hole in a tree to build their nest, and cardinals prefer small tree thickets. Males defend their territories only from males of their own species.

The females arrive later and the males sing to attract a mate. After mating, a nest is built to hide the eggs and young from predators. For most songbirds, both parents find food to feed the young chicks.

The activity you are going to do will give you an idea how park researchers study the territorial behavior of red-winged blackbirds defending their cattail marsh habitat.

Photocopy the following page for the students.

Park researchers captured and put colored leg bands on male red winged blackbirds so they could study the birds' territories. The researchers recorded the location of each bird to create a map. Now you can map out each bird's territory by finding the appropriate box and placing the initial of the color band in it. The locations of the yellow band bird are plotted for you.

(Y) Yellow band: B4, C4, E2, D5, D4, E4. (G) Green band: J2, G4, H4, G8, H9, I7.
(R) Red band: C6, E5, E6, G4, F7, D10. (W) White band: H10, I11, K13, J16, F14, L13.
(B) Blue band: J6, J9, M5, K7, N7, M8, M11, K12, J11, nest located at K9.
(O) Orange band: P9, O8, N9, N11, N14, Q9

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1																	
					Y												
		Y	Y	Y	Y												
				Y													
8																	
9																	
10																	
11																	
12																	
13																	
14																	
15																	
16																	

After you place the letters in the boxes, draw a circle to show the territory you think each bird is defending. The shaded boxes contain the best habitat for a red winged blackbird.

Can you help the researchers come to some conclusions from this information? On a separate piece of paper describe your ideas on how to answer these research questions. The information you have on this sheet might not be enough to answer all the questions. Can you think of a new observation experiment that will give you enough information to answer them? Try to think like a scientist.

(1) Which bird(s) do you think has the best territory? (2) Which birds do you think are the strongest and weakest? (3) Do blackbirds hurt each other when they defend their territory? (4) Does the age of the bird have anything to do with the location and size of the territory? (5) Where do you think you would discover the nests of each bird? (6) If the nest is built in a cattail pond, what will keep predators from discovering the nest? (7) Does the size of the territory affect the number of young that survive?

ANSWER KEY

Redwing Territory

1. The blue, green and yellow-banded birds defend territories with the best habitat. The blue banded bird has the largest territory.
2. Based on the size and location of the territories, the blue and green banded birds probably are the strongest and the orange and red may be younger and less dominant.
3. No. Most attacks involve just a test of the territory borders or a chase after a female.
4. Yes they do, but the students cannot determine that from this information. By conducting a study for a number of years researchers might see young males move into better territories as the older birds die.
5. The nests are built by the female in 3 to 6 days and are hidden in the cattails, sedges, or other vegetation just over the water.
6. Camouflage and the closeness of the cattails can make it hard for predators to find. However, redwings are frequently parasitized by cowbirds. The female cowbirds must follow the adult redwings to find the nest.
7. The students cannot answer this question with the information given. Use this opportunity to discuss how scientists gather information and draw conclusions. Just because we suspect the size of the territory might increase the number of young that survive, we cannot claim that until someone does scientific observations.

When you take your trip to West Beach, hike or stop at Long Lake so the students can observe the birds and cattails.

WHO AM I?

Play this game to make the students familiar with some of the plants and animals they may find along the Succession Trail during their field trip to West Beach. Then have them determine which community they will find these species.

How to play "Who Am I?' Photocopy the six pages of plants and animals that follow this section and cut the pictures apart. Give each student a picture and a paper clip. Without showing the picture, each student should attach the picture on to the back of another student's shirt.

After everyone has a picture, he/she should turn to show his/her organism to another student and begin to ask "yes or no" questions. For example, "Am I an animal?" "Do I have feathers?" "Am I a tree?" When they guess their picture they may move it to the front of their shirt.

Please note that some of the plants or animals are new to the students. Since there are 36 pictures, you might put some of them aside and use them for the next part of this activity.

Introducing the communities found along the Succession Trail. Along the Succession Trail at West Beach you will be stopping to experience the Beach, Foredune, Jack Pine, and Woodland Dune Communities. A natural community is composed of plants and animal that thrive together in a specific area.

Some plants or animals may only be found in one community while others are so adaptable that they use many different communities to fulfill their habitat needs. For example, the arctic bearberry's limited growing conditions are only found in the Jack Pine Community, whereas a raccoon roams to find food in all four of these communities.

Make a bulletin board. Copy the following drawing and community names on to a bulletin board. Have the students write the name of their species next to every community they think that organism is found in. Then pin up the pictures of the plants and animals so students can become familiar with the organisms before their field trip.

BEACH FOREDUNE JACK PINES WOODLAND DUNE

A LIST OF THE PLANTS AND ANIMALS FOUND IN EACH COMMUNITY.

BEACH COMMUNITY

Great Blue Heron	Opossum	Sandpiper
Herring Gull	Raccoon	Skunk
Merganser Duck	Red Fox	Spider

Scavengers like the raccoon, opossum, and skunk may visit the beach at night to look for dead fish. Students might think all animals come down to the beach for water, but many find water at Long Lake or other places. The beach offers no place to hide and some animals would never go there. Some animals can get their water from the food they eat, rain and dew on the plants

FOREDUNE COMMUNITY

Beetle	Hognose Snake	Poison Ivy	Sparrow
Black-eyed Susan	Killdeer	Prickly Pear	Spider
Butterfly Weed	Lizard	Raccoon	Toad
Cottontail Rabbit	Marram Grass	Red Fox	
Cottonwood	Monarch Butterfly	Red-tailed Hawk	
Deer	Opossum	Skunk	

There is little soil in the foredune community. Any plant that survives there must be able to survive the wind and burial by moving sand. Most of the animals visit this community.

JACK PINE COMMUNITY

Arctic Bearberry	Deer	Opossum	Squirrel
Beetle	Great Horned Owl	Raccoon	Woodpecker
Blue Jay	Hognose Snake	Red Fox	
Chickadee	Jack Pine	Skunk	
Cottontail Rabbit	Lizard	Spider	

The plants in this community survive in nutrient-poor soil. The foredunes protect this area from the brunt of the wind.

WOODLAND DUNE COMMUNITY

Beetle	Deer	Opossum	Spider
Black Oak	Great Horned Owl	Poison Ivy	Squirrel
Blue Jay	Lizard	Raccoon	Toad
Chickadee	Lupine	Red Fox	Witch Hazel Tree
Cottontail Rabbit	Mushroom	Skunk	Woodpecker

Richest in soil and sheltered from the of the winter storms, this community has a lot of diversity. Many animals find homes in the trees.

SECTION TWO

HERE IS SOME INFORMATION TO HELP YOU LEAD A SUCCESSFUL FIELD TRIP

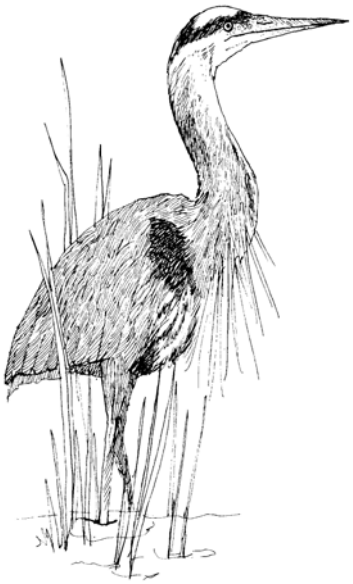
TO INDIANA DUNES NATIONAL LAKESHORE

SAVE THE DUNES.
DON'T STEP ON THE PLANTS.

WHEN THE PLANTS ARE CRUSHED
THEY DIE
AND THE WIND BLOWS
THE SAND AWAY.

A SELF GUIDED HIKE ON THE WEST

BEACH SUCCESSION TRAIL



BEACH COMMUNTIY - Though attractive to summertime sunbathers and swimmers, the beach is a hostile environment for plants. Occasionally marram grass and a few annual plants grow in the middle beach above the constant action of the waves. It's the washed up remains of insects, fish, and birds on the lower beach that provide most of the food for the animals in this community. Ring-billed and Herring Gulls feast on washed up salmon, while raccoons and skunks wander to discover if the lake has provided another night time meal.

During spring migration, sandpipers probe the sands for prey, while a lucky observer may see thousands of merganser ducks floating a few hundred feet from the beach. Great Blue Herons come to look for fish to feed to their young chicks and gracefully fly away if your group is too noisy.

Quick Activity - Allow the students to sit on the beach without talking. While they are sitting in this community they should observe or make a prediction about: (1) the temperature extremes from summer to winter; (2) the strength of the wind during a storm; (3) the temperature of the ground on a hot summer day; and (4) the amount of moisture in the soil during the summer. You can use bubbles to check wind speed and have students dig into the sand to determine soil moisture. Have them record these conditions so they can compare them to other communities they will see today.

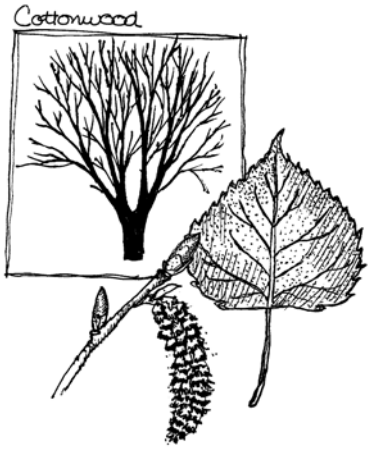
FOREDUNE COMMUNITY - A profusion of yellow from the hairy puccoons that intermixed between the exploding white blossoms of the sand cherries delight the May visitors who have waited too long for spring. The new green shoots of the marram grass indicates these important dune builders are growing again and will continue to hold the sand in place.

Surviving the barrage of sand brought by the wind, the marram grass prevents a sand burial with specialized underground stems called rhizomes. Able to elongate when covered with sand, the internodes of the rhizomes may grow eight feet up through the sand to reach sunlight. With the ability to spread up to 20 feet in all directions, their thread-like roots act like a net under the sand, thereby stabilizing the dunes.

Fun Stuff - To highlight how the marram grass roots interlock and form a net to hold the sand, have the students play this variation of red rover. Play it on the beach before hiking into the foredunes to prevent walking on the plants and damaging them.

Have four students stand in a line holding hands. They represent marram grass and its roots. Allow a student to run up and try to break through between two students. If the student is unsuccessful they make the dune larger by joining the line. To prevent anyone from getting hurt, have the students run uphill. Strong students should be limited to attempting to break through the line where two other strong students are holding hands.

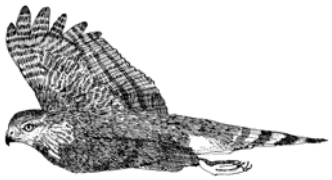
Cottonwood leaves rustling in the wind provide welcome shade in an exposed environment. Seeming out of place in this sandy, bright, almost desert-like foredune the cottonwood adaptations are only revealed to the careful observer. Sprouting in low, sheltered spots, the young tree can survive sand buildup by the time it's a few feet tall.



If the tree limbs are covered with sand they will sprout roots. Likewise, if the wind exposes the roots by blowing away the sand, the roots will sport new stems and leaves. What might appear as a small tree may be a 50-foot tall giant covered by the shifting sands.

Quick Activity - Give students the time to search for evidence of animals in this community. The zipper-like tracks of beetles are a road map of their activities. Tail impressions between the tracks of fast moving feet are left by the six-lined racerunner, a lizard that was searching for an insect meal. Toads hop under the grass and it's a lucky group that discovers a toad's tracks ending at the scene of a struggle with a snake. Remember, please do not destroy the dunes by walking on the plants.

Hawks circle overhead looking for white-footed or deer mice. An Eastern Kingbird is conspicuous as he perches on a cottonwood limb. Bursting into a quick flight that often looks like aerial combat, the Kingbird returns to the same tree with an insect.



Hiking behind the foredune nearest to the beach, you will notice how the community changes from the pioneer marram grass and cottonwood trees that are stabilizing the dunes. In late summer, monarch butterfly caterpillars eat the leaves of the butterfly weed, while adult butterflies visit the orange flowers. Grapes provide late summer food for sparrows and goldfinches that also eat the marram grass seeds. Don't confuse the poison ivy with the three-lobed leaves of the hop tree. Prickly pear cactus, little blue stem and sand reed grasses are members of this community.

Quick Activity – Once Lake Michigan is blocked from your view by the first set of small dunes have the students sit on the trail and make the same observations about sunlight, wind, soil temperature, and soil moisture. They should make their observations about the areas with the plants on them, not the bare soil of the trail. Sitting on the trail helps prevent damage to the plants and protects the dunes.

JACK PINE COMMUNITY - Entering a grove of jack pines is like moving back to an era of colder climatic conditions. As the Ice Age was closing, most cold-adapted plants gradually retreated northward. Provided the proper growing conditions in the chilly pockets between the dunes closest to the cooling effects of Lake Michigan, an isolated colony of jack pines grows 60 miles further south than any other community of jack pines around the Great Lakes.

Jack pines are so well adapted to the cold that they live further north than any other pine. They are able to grow in the humus-free dunes as well as the nutrient poor tundra because they require only small quantities of nutrients like calcium.

Quick Activity - Grab a needle of the jack pine and follow down to its connection on the branch. Its has a partner and the two needles form a bundle. If you put the two needles together you will see they form as one needle that splits apart. The number of needles in a bundle is an important way to identify a pine. For example, the white pine has five needles per bundle, so remember there is one needle for each letter in the word WHITE. If the students want a closer look, have them pick up needles from the ground to prevent injury to the trees.

The low growing Arctic bearberry is another Northern Forest plant. The bearberry reproduces like the marram grass by sending out runners. They can withstand slow sand burial but do not grow fast enough to survive a rapid pile-up. Growing behind foredunes stabilized by marram grass and cottonwoods, the bearberry forms a special relationship with the jack pines.

When Jack pine seeds germinate, the bearberry provides enough protection from wind and blowing sand to allow the seedlings to grow large enough to fend for themselves.

Common junipers and red cedar trees (a type of juniper) grow in this community. With single needles instead of bundles and having a berry-like fruit instead of cones, it is easy to see the difference between these junipers and the jack pine. Junipers often appear on the slopes of the dunes before the taller pines

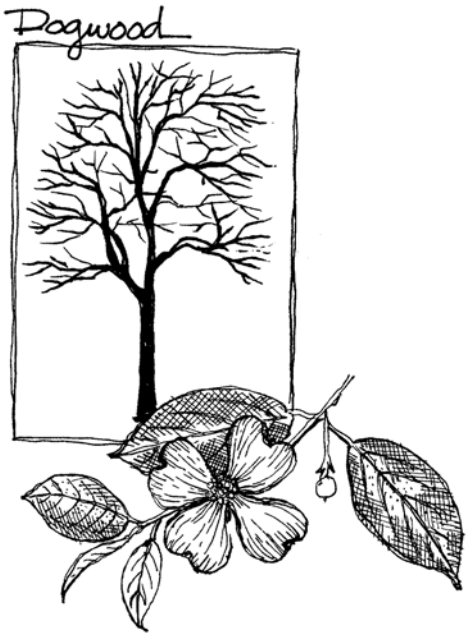
Quick Activity - Again, allow the students time to make their observations of sunlight, wind, soil temperature, and soil moisture.

During spring migration, the pines can be alive with songbirds that stop to rest and feed. During harsh winters further north, Great Horned and Northern Long-eared Owls, and three types of finches (Evening Grosbeaks, Crossbills, and Pine Siskins) all seek food and cover in these evergreens.

Quick Activity - Have students look for crab spider webs in the trees. Roll up a small part of a leave and toss it into the center of the web. The spider will come and check to see if it is an insect and then cut the leave out of the web. Don't use a large piece or you will damage the web.

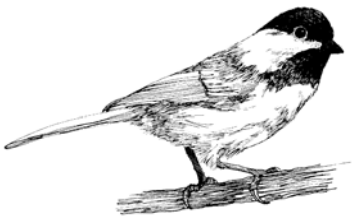
BLOWOUT - The steps were built in a bare sandy area called a blowout. Heavy human use destroyed the marram grass and the wind whistled through to carve out this depression. Sand blasted or buried, most of the plants died. A tree graveyard of blackened tree trunks once buried by sand is now being re-exposed as the sand moves on. Little decomposition occurs in the sand, so exposed tree trunks can still be erect and retain their original shape.

WOODLAND DUNE COMMUNITY - On a hot summer's day it's a welcome relief to enter the refreshing coolness of the woodland dune community. Black oak, hickory, ash, and basswood trees form the canopy of tall trees. Witch hazel, sassafras, dogwoods, and ironwood trees grow underneath. The diversity of plants indicates this dune is far enough from the lake to be protected from wind and winter storms.



Plants in this community compete for sunlight, nutrients and moisture. When a tall tree dies and falls over, the bonus of sunlight can cause a spurt of growth in the young trees below. For a few years, lupines, ferns and other sun loving plants might grow until young trees, benefiting from the addition sunlight, reach the canopy.

Quick Activity – Look at the leaves of the young oak trees that grow in the shade of the canopy. Compare the size of the leaves of the young trees to the leaves on the older trees growing in the sunlight high above you. (You might also see some of these leaves on the ground in the fall.) Oaks grow tall reaching into the sunlight. To prevent moisture loss the leaves are small at the top. To get enough sunlight to grow in the shade, young trees have large leaves that come out earlier in the spring than the older trees' leaves.



Rich with food for animals, a hike through this community might offer evidence of raccoons, deer, skunks, opossum, squirrels, chipmunks, red foxes and rabbits. Over 100 species of birds have been seen in the oak forest community. Woodpeckers, Blue Jays, and Chickadees are seen all year round. A quiet group has the best chance of seeing these animals.

Quick Activity - This is the last community for the students to observe the sunlight and air temperature. Have one student step off the boardwalk to dig a hole for soil temperature and moisture and report his/her findings.

DRAWING CONCLUSIONS FROM THE STUDENTS OBSERVATIONS

What community is the harshest one for plants to grow? **Beach**

What environmental factors are the most extreme on the beach? **Hot and dry soil. Plants get sandblasted and buried by wind.**

What community has the best growing conditions? **Woodland dune.**

What growing conditions are best in the oak forest? **Good soil, more soil moisture, and protection from the wind helps many plants.**

Could jack pines grow in the woodland dune forest? **No**

Why not? **Not cold enough and would be out-competed by the taller and faster growing oaks.**

Why don't the oaks grow in the jack pine forest? **Too cold and not enough nutrients or moisture.**

The next two questions are meant to explore the students' feelings about the park. (1) If you could sit alone for one hour, what community would you like to spend your time in? Why?
(2) Everyday you make choices. Today you chose to visit the park without damaging the plants. If you came back to the park, do you think you would run through the dunes and possibly damage the plants or stay on the boardwalk to protect the park?

POSTCARDS FROM THE DUNES

The objective of this activity is to allow the student to describe how she/he feels about Indiana Dunes and the things she/he observed.

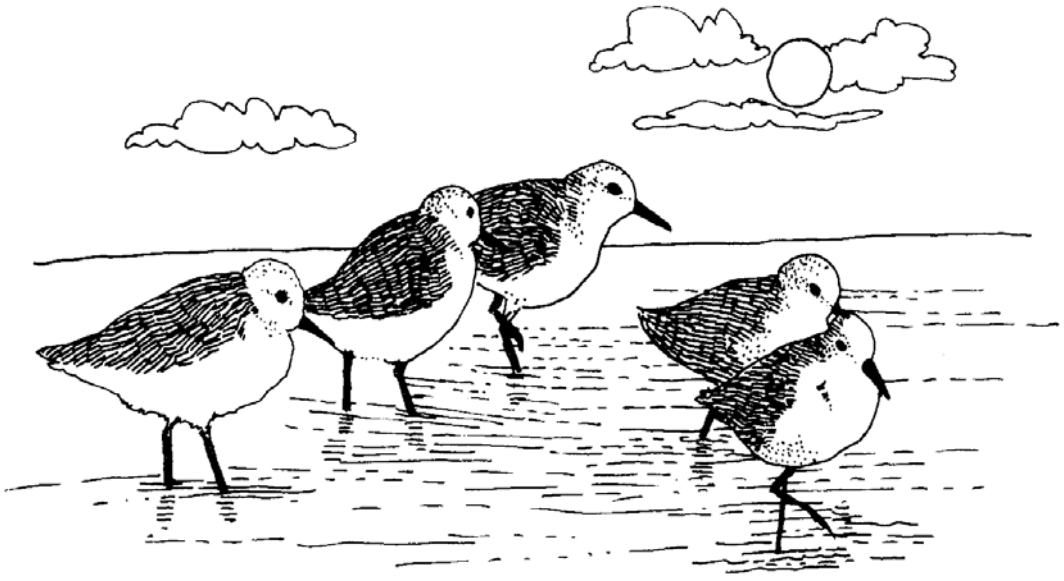
Procedure: Give the students a blank 4 by 6 index card. On one side they can draw a picture of the dunes and on the other they can write how they feel about the park. Ask them to be more complete than just saying "cool" or "awesome.

Students should spread out and work alone without talking. Talking can take the students away from observing and having feelings for the park.

Another option is to write along the edge of a note card the words, "Indiana Dunes". Using those letters the students should compose an acrostic poem which includes things they have seen, heard, felt or learned at the park.

I can see Lake Michigan
Near me.
Dozens of gulls
Interrupt my thoughts
As I
Notice them flying
Above my earth bound seat.

Do you ever wish or
Unconsciously hope you could
Navigate the skies like they do?
Everyday I dream of the
Serenity they feel while flying
over these dunes



EXTENSION FOR UPPER GRADES

During your one-mile hike on the succession trail you will travel through time from a young community on the foredunes to the woodland dune forests that took thousands of years to evolve. At the turn of the century, Professor Henry Cowles from the University of Chicago helped create the science of ecology, when his studies showed a dune of sand where only the hardiest plants survived could change to soil rich enough for a woodland dune forest.

As you hike with the students, have them notice the sharp change of plants on the long narrow foredune just above the beach. Without the sand-holding abilities of the foredune marram grass, the first dune would not rise high enough to provide the shelter from the wind that sand cherry, sand reed grass, little blue stem and other plants need to grow.

Professor Victor Shelford explained that animal communities go through succession too. The diversity of animal life increases as you hike from the beach through the plants on lee side of the dune and up to the hardwood forest. Look for their signs.

The human created blowout near the pine community has already engulfed the boardwalk below and threatens to invade the jack pine community. The precious little soil that took hundreds of years to create will become buried in sand as the pines are covered. The plant community might revert back to plants more tolerant to the shift sands.

This would not be the first forest to disappear under the sands. The ghost trees, exposed in the blowout near the jack pines, are evidence that succession in the dunes can go both ways. Succession is not a straight line from beach, foredune, jack pines, to a woodland dune forest. Notice that environmental changes like fire, shifting sands, or human disturbances cause the most obvious changes in succession of these plant communities.

Succession is evident through the lakeshore. Homes, fields, and industrial sites, bought to create the National Lakeshore in 1966, soon were covered with pioneer plants like the sun-loving grasses, ferns, and wildflowers. In turn they provide a suitable habitat for the seedlings of vines, bushes and sun-loving trees. Within a few years, thickets of blackberry, poison ivy, and sumac trees started to replace the grasses. Later, they provide the proper conditions for the germination of oaks and hardwoods trees that will eventually grow to replace them. The woodland dune forest is the climax community.

Forest fire is one way succession reverts back from a climax forest community to pioneer plants. Many species of plants and animals are dependent upon natural wildland fires to create open areas. The Karner blue butterfly has become endangered by the loss of habitat to human building and the suppression of fire. Prescribed burns in the park are necessary for slowing plant succession.

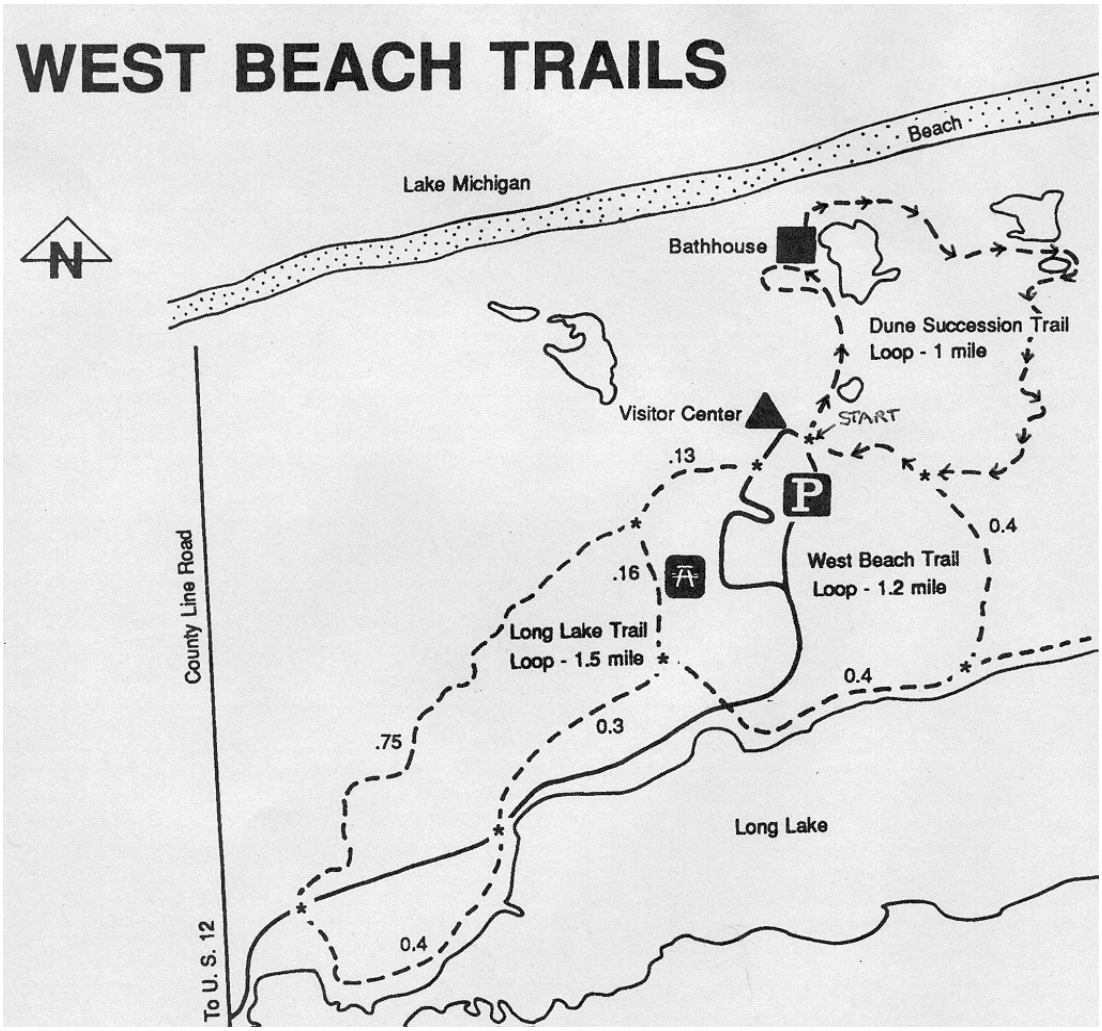
Project Wild Elementary Activity Guide has two classroom activities about succession, “Forest in a Jar” and “Pond Succession”, pages 91 to 94.

A GET IN FREE PASS FOR WEST BEACH

During the spring and summer months, a fee is charged to enter West Beach. A West Beach, Educational fee waiver is avalible for groups. See instructions on our websites Plan a Field Trip page: http://www.nps.gov/indu/forteachers/planafieldtrip.htm or call (219) 395-1857.

DIRECTIONS TO WEST BEACH

West Beach is located off of County Line Road, approximately 1 mile from the intersection of County Line Road and U.S. Highway 12. From the **Junction of I-94 and U.S. Highway 51,** travel north on U.S. Highway 51 to U.S. Highway 20. Travel east on U.S. 20 to County Line Road (the first stoplight on U.S. 20). Turn left onto County Line Road, traveling north. Cross U.S. Highway 12, and two sets of railroad tracks. Continue north on County Line Road to the entrance road of West Beach.

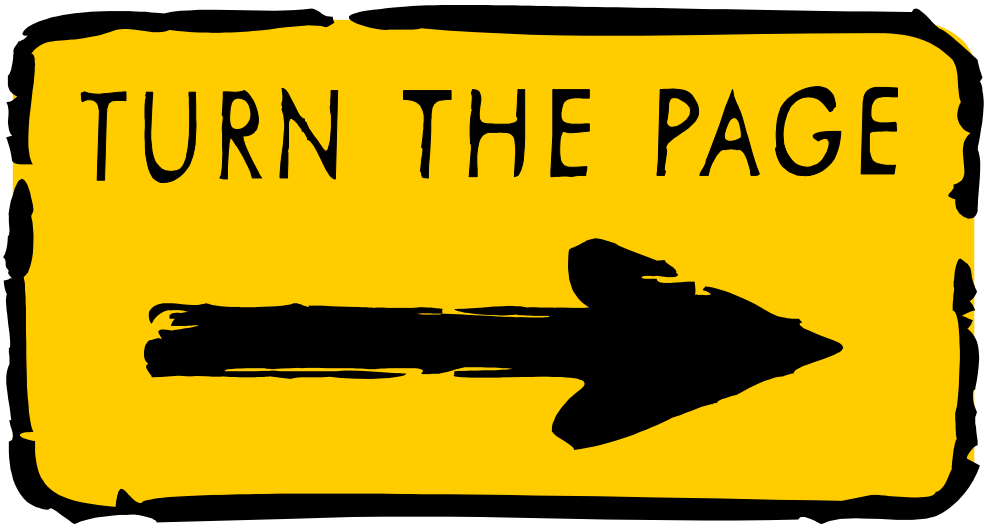


The Succession Trail starts on the paved road from the Visitor Center to the Bathhouse.

SECTION THREE

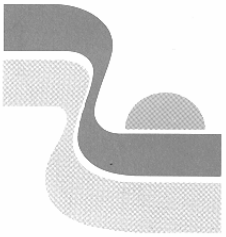
HOPE YOU HAD A GREAT FIELD TRIP

NOW TRY THESE ACTIVITIES IN YOUR CLASSROOM SO STUDENTS CAN USE CRITICAL THINKING TO LEARN ABOUT THE CRITICAL RESOURCE ISSUES THE RANGERS AT INDIANA DUNES ARE TRYING TO SOLVE.



WHAT IS A CRITICAL RESOURCE ISSUE?

INDIANA DUNES
NATIONAL LAKESHORE



Read this information to your students.

When the National Park Service was created in 1916, Congress instructed the new agency to allow people to use the parks and to preserve and protect these areas so future generations will see them undamaged. The rangers have identified many threats to Indiana Dunes, which they want to stop before the damage gets worse. Some of the threats are so critical that they must be stopped or slowed now before the park is changed forever.

There are four categories of critical issues: alien species, habitat loss, unbalanced populations within the communities, and collecting.

ALIENS - Aliens are invading the park. Not the type of aliens that arrive in UFO's but ones that come from other continents. Purple loosestrife and garlic mustard are plants from Europe. When they were brought to the United States and used as ornamental plants around houses, their seeds spread and now grow in the park. None of the North American insects or animals will eat these aliens, so they grow rapidly and crowd out our native plants. Zebra mussels are one example of an alien. They were brought from Russia and now are growing out of control in the Great Lakes and many of our rivers.

HABITAT DESTRUCTION AND LOSS - People love to come to the park, but they do not know the damage they may cause when they walk off trails. When people kill plants by stepping on them, the dunes can blow away. Houses, industries, and roads built around the park took the habitat needed for plants and animals. The destruction of forests, prairies, and wetlands in our country is just as critical as the destruction of the tropical rain forests at the equator. With all this habitat destruction the 16,000 acres preserved at Indiana Dunes is critical for plants and animals.

UNBALANCED POPULATIONS WITHIN THE COMMUNITIES -Some species such as raccoons, Ring-billed Gulls, deer, and Cowbirds adapted to the changes in the environment created by people. The populations of these animals also increased when wolves, mountain lions, bobcats, and other predators were removed. The abundant raccoons and gulls destroy bird nests, deer eat the plants growing under the trees and deprive birds of nesting sites, and cowbirds lay their eggs in other birds' nests.

COLLECTING AND ILLEGAL HUNTING - Everything in the park is protected, but some people collect plants for foods, pick the flowers, take animals for pets, or illegally hunt. Each flower is needed to produce seeds. Each snake, turtle, or other animal is necessary to produce young and help keep the food web in balance.

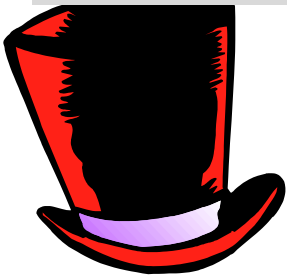
The following activities will help you understand some of the critical issues that park rangers are trying to solve. Some do not have a solution but scientific studies are starting and they might help produce a solution.

BEAVER GAME

Park rangers protect animals and plants from people who would hunt and collect them. Read the following information to the students and play the beaver game to learn more about the policy to protect everything in a national park.

The first fur trading site established in Northwest Indiana is preserved at the Bailly Homestead in Indiana Dunes National Lakeshore. During the 1820's, Joseph Bailly built a cabin for Potawatomi Indians to come to trade furs for metal or cloth goods. Beaver pelts were the most valuable because stove pipe top hats made from beaver fur were the fashion of the time.

We will play a game about the fur trade. Imagine you are a Potawatomi Indian and Joseph Bailly just arrived with many trade goods that will change your life and wealth



Objective: Students will be able to explain how over-exploitation of beaver caused them to disappear from this region.

Materials: Use 150 tokens to represent beaver.

1. Count the number of students and multiply by three. This is the number of tokens you need to start the game.

2. Every year the Potawatomi would trap beavers for trade. Each student will decide how good of a trapper he or she wants to be. Inform them that the more beaver they get, the more trade goods they will receive.

3. With the students sitting in a circle, place the tokens representing beavers into a hat or box. As the hat is passed the students can choose to take one, two, or three tokens to indicate how successful they were trapping beaver this year. Taking three tokens indicates an excellent hunter. No talking is allowed as they pass the hat.

4. When the hat is returned to you, count the number of tokens left. Place an equal number of tokens into the hat to represent new babies produced by the remaining beavers.

5. Pretend it's a new year and pass the hat to allow the students to choose one to three beaver tokens. Expect the students to be greedy and all the beaver tokens will be gone.

6. Allow the students to play a second time but encourage them to talk to each other. Hopefully, they will limit the number of tokens they take so there will be a sustainable population.

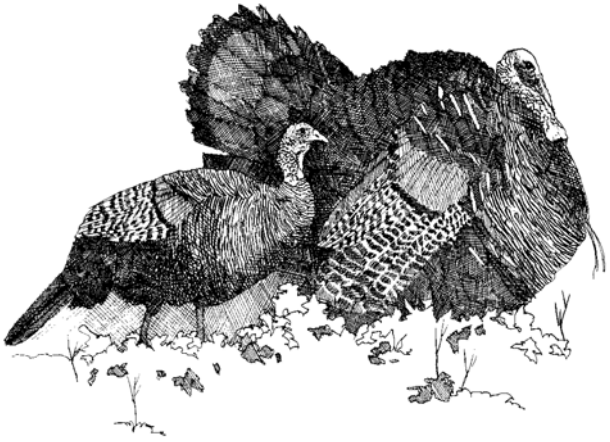
After playing the Beaver Game read this section to the students.

Native Americans lived in the Indiana Dunes region for thousands of years. Even though they affected the natural resources in this area, their impact and technologies were not significant enough to cause the depletion of the native species. Metal traps obtained from Joseph Bailly and the importance of furs as a trade good started a decline in animal populations.

After Joseph Bailly's arrival, more European immigrants came to this region and cleared land for farms. Animal populations declined because of habitat loss and hunting. Some, such as the passenger pigeon, became extinct, while others like the bison, otter, beaver, bear, bobcat, and turkey disappeared from NW Indiana.

Since Indiana Dunes National Lakeshore was created in 1966, park rangers have tried to help plants and animals that are in danger of extinction. One effort is to provide the endangered Karner blue butterfly with the appropriate prairie habitat it needs. A second goal, is to help reintroduce animals that have disappeared into the park. Beavers and possibly turkeys have moved into the park on their own. Rangers have discussed bringing back bobcat and otters.

Conclusion for This Activity: The purpose of this activity is for students to come to the conclusion that, in combination with habitat loss, poaching and collecting can lead to extinction. The following questions will help wrap up this activity.



- What did this activity show you?

They may suggest that all plants and animals should be protected from picking or hunting.

- Would you like to have turkeys come back to the park?
- Would you like to see wolves live in this area?
- If you feel different about these two animals could you explain why?

Their answers might be turkeys are OK but they fear wolves. There are no documented cases where a wolf has killed a human in North America, and we have only three cases where someone has been injured. Fear of wolves comes from fairy tales. However, we do not have enough land for wolves. They would travel outside the protected areas of the park, which would be a problem.

- Without bears, wolves, and otters can this park be totally natural?

No, without predators many animals like deer, opossum and raccoons become overpopulated and have a negative effect on the forest.

- Could park rangers bring bears and wolves back to this area?

No, explain how some animals such as a bear need a habitat space larger than 16,000 acres. This is a problem the park may never be able to remedy.

- Since beavers have returned to the park what changes to the community do you think they make?

Possible answers include; their ponds will provide more wetland habitat and help aquatic animals. By cutting down trees more sunlight will reach the forest floor and allow different plants to grow. They will have an impact on the population of plants they prefer to eat. If you like to canoe the Little Calumet River it will be harder since more trees are down across the river. They might become food for coyotes.

- Now that you know picking flowers can remove important seeds and collecting insects or other animals can lead to animals disappearing, do you think you will act differently when you come to a park?
- In what way?

COWBIRD MIX-UP

Park rangers are concerned about the decline of songbird populations. Please read the following background information about this critical resource issue to the students

A park ranger, exploring a marsh, was enjoying the songs of the birds. The cattails had grown chest high by this June day. A flash of yellow caught the ranger's eye and she saw a beautiful Yellowthroat Warbler leave her nest. The ranger thought about all the people who come to the park to birdwatch and how much they would enjoy seeing this beauty.

As the warbler flew to find food the ranger saw a cowbird quickly drop down into the nest. In just one minute the female cowbird laid one of her eggs and departed.

The ranger knew this would be trouble for the warbler. The warbler would come back and not recognize the difference between her own eggs and the Cowbird's. She would sit on all the eggs to help them hatch. The Cowbird egg would hatch first and the parents would feed the chick. By the time the warbler's eggs hatched, the Cowbird would be much bigger and demand most of the food.

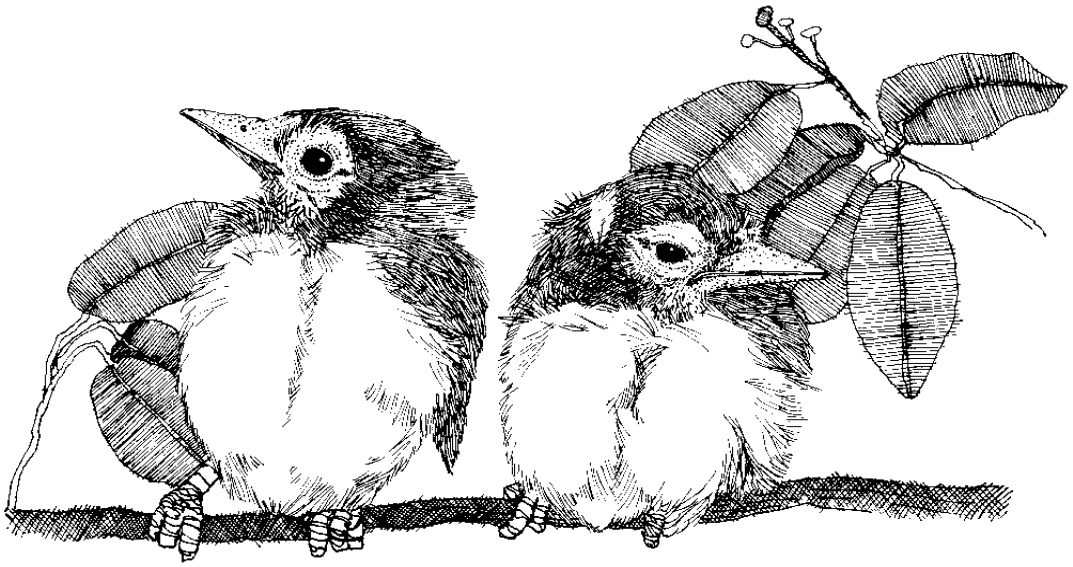
Soon the warbler chicks would get weak and be pushed out of the nest by the Cowbird. The warblers would be good parents to the Cowbird and try to find enough food for this chick. Soon it will be larger than they are.

By the time they finish, the warblers would raise a Cowbird chick but none of their own. Research tells us the populations of songbirds like the warblers are decreasing because Cowbirds now live throughout the United States and Canada.

How did Cowbirds become a problem? They are native birds that once lived only in the prairie areas where large buffalo herds were found. The birds ate the insects that the buffaloes stirred up. Since Cowbirds had to follow the continuous moving buffaloes, female Cowbirds had no time to build nests and raise their young. They adapted by laying an egg in another species nest so that pair of songbirds would raise the chick.

When people removed the buffalo by hunting, Cowbirds started to live near the cattle the people brought. As people cut down the forest and made pastures and fields, the Cowbirds moved throughout the US. Now Cowbirds have the opportunity to find the nests of the birds that live in Indiana Dunes. The number of songbirds in this park and everywhere else is decreasing. This is a critical problem for anyone who loves birds and the park. The rangers do not know what to do about this problem, but they want to teach you a game that will show you how quickly the Cowbirds affected the population of songbirds like the warblers.

1. Cut out the words "nest", "territory" "eggs hatched", "found a mate" and "cowbird". Glue them on a card.
2. Use the concept of a baseball diamond and designate four bases. Have the students randomly choose a base to stand near. (There needs to be at least eight students near each base. If the group is small only make three bases.)
3. Place the cards in the center. Instruct the students to pick up one card and go back to their base.
4. Have each student secretly look at his/her card. The students with the "found a mate" cards should raise their hands. Groups without a mate can't reproduce.
5. Ask each group with a mate to reveal a "food", "territory", and "eggs hatched" card. If all of these cards are present, the parents raise their chicks successfully.
6. After one or two rounds of the game, explain how the deep woods habitat is changed as people cut down the trees. Cowbirds now become plentiful in the open areas and fly into the woods to lay their eggs in a songbird's nest. Place a Cowbird card in with the rest and play the game again.
7. Each time a Cowbird is successfully raised by the songbird add another Cowbird card. Soon everyone will be raising Cowbirds.



CONCLUSIONS

- Name an adaptation the Cowbird has. **Laying eggs in another bird's nest.**
- What habitat would you find Cowbirds looking for food? **Prairie, pastures, or fields**
- How are Cowbirds changing the community of animals at Indiana Dunes? S**ongbird populations decrease as the cowbird population increases. Mosquitoes, caterpillars and other insects may be increasing since insect eating songbirds like warblers are declining. With more insects many plants may be damaged by infestations.**
- Conclude this activity by discussing how all plants and animals in a community are interconnected.

Copycat page – Cowbird Mix-up – Need one photocopy for any size class.

COWBIRD

COWBIRD

COWBIRD

COWBIRD

Copycat page – Cowbird Mix-up - Need eight photocopies for a class of 32 students

TERRITORY

NEST

EGGS HATCHED

FOUND A MATE

DISAPPEARING FROGS

The frog and toad populations are declining worldwide. Park researchers do not know if the frog and toad populations at Indiana Dunes are in trouble so they are starting to make a baseline study for future comparisons. Please read the background information about this critical issue to the students.

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Scientists studying rain forests, mountains, and wetlands have noticed an alarming decline throughout the world. Draining wetlands, building dams, cutting forests, and other habitat altering activities can account for a lot of the decline but not for the decline in undisturbed national park areas.

Could it be airborne pollutants going through the moist skin of frogs? Maybe increased solar radiation caused by damage to the ozone layer? Maybe the ultraviolet light is affecting the eggs.

Indiana Dunes is starting to monitor the frog population in the park. On spring evenings researchers go out to listen to the frogs calling. Each species has a different mating call. Researchers determine the size of a frog population by listening to the frogs calling. When a researcher hears only one frog at a time calling, she records the population as Level One. Level Two is reached when the researcher can hear individual frogs calling but their calls overlap. Level Three indicates so many frogs are calling it sounds like a chorus.

This will provide the park with a baseline study for comparison in the future. If the research indicates a decrease in the singing levels the park will know there is a problem. No one knows the reason for the worldwide decline. If the frogs and toads at our park have a problem, there may not be a solution we can use to help them.

Fun Activity –This activity will help the students understand the 3 levels used in the monitoring surveys. You need three groups. Each group should choose a different frog or toad call. Choose two or three students to call once every three seconds so their calls do not overlap. They represent Level One. A larger group should voice their calls so there is an overlap that would represent Level Two. The largest group of students can call continuously so they produce a chorus that represents Level Three.

Bullfrog *Jug-oh-rum*	**Chorus Frog** *Run fingers over the teeth of a comb*
Cricket Frog *Tapping of two stones*	**Fowler's Toad** *Crying baby*
Tree Frog *hey-baby*	**Green Frog** *Plucked banjo string*

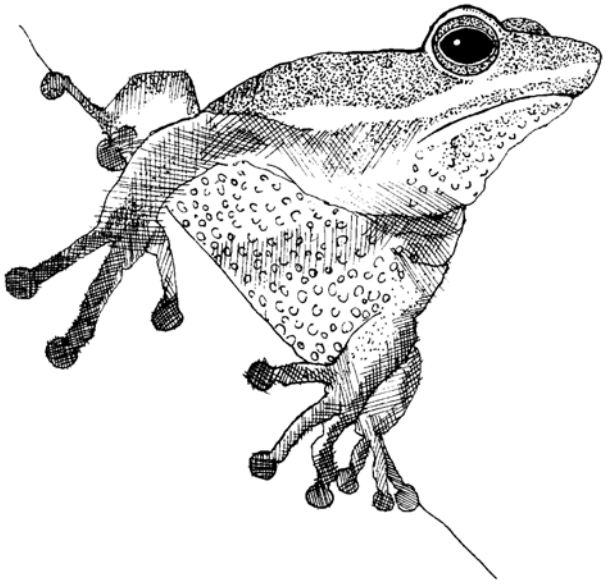
Follow-up questions:

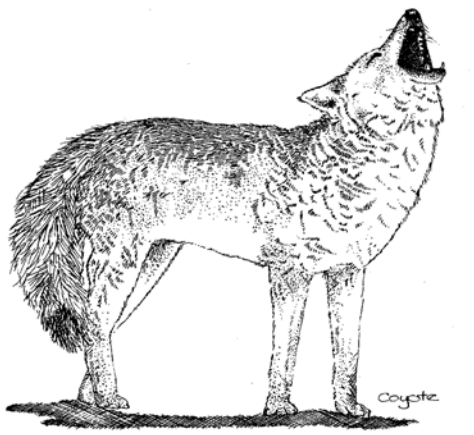
- What would the night sound like without frogs?

- Thinking question: What effect would a decline in the frog population have on other animals? **Many animals such as herons, fish, and snakes eat frogs. Frogs eat hundreds of bugs including mosquitoes. As the frog populations decline the web of life gets out of balance.**

- Emotional question: How would you feel if the frogs disappeared?

- Critical thinking question: How can scientists determine the cause of the decline? **More research projects need to be designed. Is acid rain in Indiana bringing pollutants into the water? Is there some sort of disease? Is this just a natural decline and frog populations will rebound?**





ORIGAMI WOLF

Indiana Dunes is missing members of its wildlife community. Bison, elk, lynx, bobcat, mountain lion, bear, and wolves disappeared when their habitat was disrupted and hunting increased. Read this background information about efforts by rangers at Yellowstone to restore their wildlife community. Learn why this cannot be done at Indiana Dunes. Fold an origami wolf to help remind the students about the missing community members.

A pack of Yellowstone wolves silently move through the snow as they stalk an elk. Together they burst into a run and attack. On a bluff above, a park researcher watches the wolves first cripple, then kill the elk. After gorging themselves, the wolves wander into the nearby trees to rest.

Catching the scent of the dead elk, a coyote comes up for a meal. Seeing the coyote, the wolves spring to their feet and give chase. Later the researcher hears the howls from the wolves, which announces the killing of the coyote.

How things have changed. In the 1920's, the government hunted and trapped all the wolves living in Yellowstone National Park. At that time, wolves were perceived as an unnecessary member of the wildlife community. For 75 years, without the competition from wolves, coyotes increased in numbers and created large packs. In 1995, the National Park Service brought wolves from Canada to Yellowstone. The wolves, not willing to tolerate coyotes, have rapidly changed the wildlife community.

With the return of the wolf, Yellowstone is one community that has all its original members. Researchers are seeing many changes they did not expect. The coyotes hunted many small mammals and birds. Since wolves eat larger prey, scientists expect an increase in the small animal populations. Visitors will have even a better chance to view Yellowstone wildlife.

Indiana Dunes has a wildlife community that has lost its large predators and mammals. Visitors will not see bison, elk, lynx, bobcat, mountain lion, bear, and wolves. With only 16,000 acres, Indiana Dunes is too small a habitat for these animals, so you will never get a chance to watch them here.

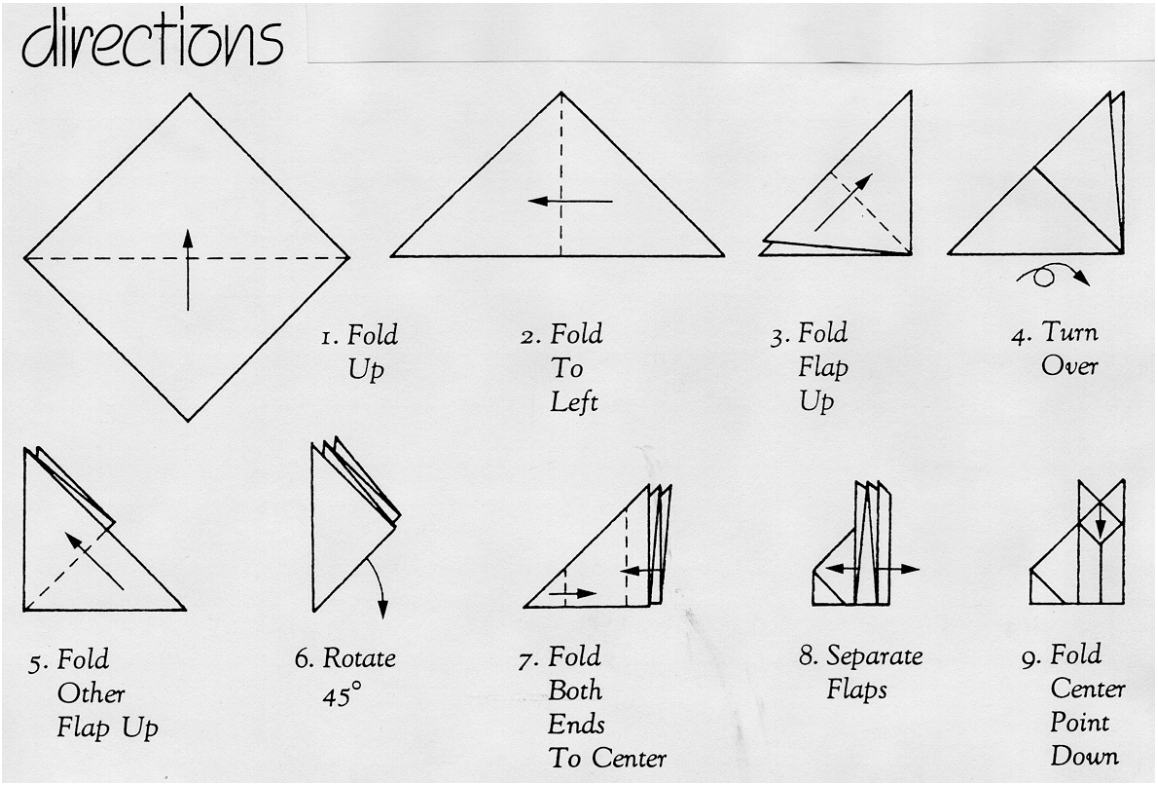
Some animals have increased after the predators at the dunes disappeared. Now there are too many raccoons, opossums and deer. The affect of the high-density deer herds is evident throughout the park as road kills increase and the plants in the forest are eaten. To be in balance a natural community needs all its members. To make sure more members are not lost, rangers work hard to protect endangered species from disappearing.

Questions for discussion:

Without predators, the raccoon population can get too high. What effect does this over-population have? **Raccoon eat bird eggs and chicks, small mammals, and aquatic animals. Killed by cars on the highway, their bodies attract scavengers that might be killed also. Looking for garbage, they become dependent on humans for food.**

How does an over-population of deer cause stress on the community? **When hiking through Indiana Dunes notice how much of the understory is browsed by deer. This affects birds that hide their nests on the forest floor under bushes. Without cover these birds are rarely successful at raising young. Could things like Lyme disease arrive here on ticks carried by the deer? Road kills are a hazard. Many species of plants that deer like to eat are getting rare, and those that deer find undesirable are overpopulating.**

Fold a square piece of paper into a wolf to help remind the students of the missing members of the Indiana Dunes wildlife community.



BURNING FOR BUTTERFLIES

The endangered Karner blue butterfly is helped by the prescribed burns in the park and students growing plants in their classroom. Read the following section to your students before they do the copycat page.

Carrying insect nets, a group of park researchers hike into Miller Woods to search for the endangered Karner blue butterfly. The butterflies are found living near lupine plants that grow under the oak trees... The lupine plants are the only food for their caterpillars. The adults live for only five to fourteen days and spend this time looking for a mate.

To help prevent their extinction, researchers need more information about the lives of these insects. Sweeping their nets above the lupine they capture these one-inch butterflies and carefully mark numbers on their wings before releasing them. The goal of this research is to recapture the butterflies and see how far they have moved.

Lupine has a beautiful blue spike of flowers and a distinctive palm-shaped leaf. In years past, forest fires burned openings in the woodland dune community where the lupines grew under the trees. Now forest fires are put out quickly after they are discovered. The trees grow so large they prevent sunlight from reaching the lupines below. As the lupines stop growing, the butterfly population has declined toward extinction.

Researchers have found only two areas in the park where a population of butterflies live. They wondered if the butterflies from one population could fly over to mate with members of the other population. You will be able to use their research data to help determine the answer to this question.

ANSWERS TO THE COPYCAT PAGES THAT FOLLOW.

1. No, 80% of the captured Karner blue butterflies travel less than 300 meters.
2. The two distinct populations of butterflies in the park are the largest in Indiana.
3. The two populations are isolated from each other.
4. The maximum distance a butterfly traveled was 2500 feet. If one population dies out the other population is not close enough for butterflies to naturally repopulate.
5. Three
6. Yes. Butterflies have been captured showing they move from one plot to another.
7. Yes. Creating new habitat helps the Karner blue butterfly, but the park will always be concerned about their survival. The park will need to continue with prescribed burns and monitoring the butterfly's population. Please emphasize that students helped collect seeds, grow seedlings and replant. Students should know they could make a difference.

COPYCAT PAGE

Make a map showing the locations where researchers captured butterflies by placing the number in the boxes. Some boxes might have more than one number.

Butterfly number 9 – M10, N10, M12, M11
Butterfly number 10 – B3, A2, C5
Butterfly number 12 – K7, K8, K10, J6
Butterfly number 13 – K7, L8, L9
Butterfly number 16 – C5, C6, D6, B6
Butterfly number 17 – B4, C3, D3, D4

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
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Be a scientist and see if you can answer these questions. Use the information you put on the map.

1.The shaded boxes indicate where the lupine grows. Do Karner blue butterflies travel very far away from the lupine?

2. Does the lupine look like it grows throughout the whole map or in two patches?

3. Did you find any butterflies that flew from one patch of lupine to the other?

4. Suppose all of the butterflies in one patch died and the butterflies in the other patch survived. Would the surviving butterflies fly far enough to repopulate the other patch?

Lupine flower

Park rangers and researchers devised a plan to help the butterflies. First they had a prescribed burn. This is a controlled forest fire where rangers do not allow the fire to burn too hot. The fire did kill some bushes and small trees so more sunlight reached the forest floor.

Then fourth and fifth grade students came out and collected seeds. During the winter they grew lupine, grasses, and wildflowers seedlings to plant in the spring. With the fire and the help of the students a prairie community was regenerated. Place the numbers of the captured butterflies on the map.

Butterfly number 23 – C4, D4. B4
Butterfly number 25 – D5, D4, E4, F5
Butterfly number 26 – F6, G5, H7, H6
Butterfly number 30 – I6, I5, H6, J6
Butterfly number 33 – K9, K7, J7, I6
Butterfly number 35 – K10, M11, M12

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
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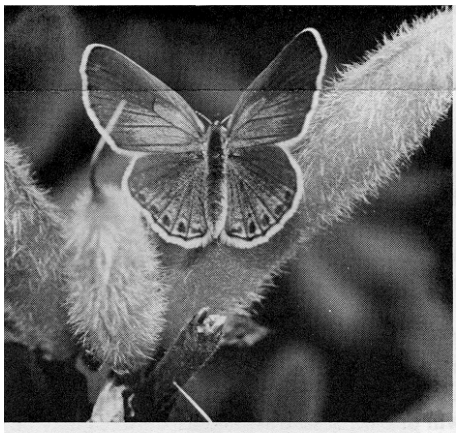
5 How many patches of lupine are on the map?

6 Can you tell if the patches of lupine are close enough for butterflies to move from one patch of lupine to another?

7 What if all the butterflies in one patch died, could butterflies from the other patches migrate in to repopulate the patch?



FEMALE KARNER BLUE BUTTERFLY

INDIANA DUNES TABOO

This is a good activity for students to describe the things they learned about or saw during their visit to Indiana Dunes.

Rules of the game: (1) Divide the students into two teams. Team A will go first.

2.Team A designates a person to be the clue-giver. Have the clue-giver sit away from his team. Place the taboo cards face down in front of the clue-giver. Designate someone from Team B to be the checker and look over the shoulder of the clue-giver.

3. When Team A and the clue-giver are ready, start timing for 75 seconds. The clue-giver can turn over the first card and hold it in his hand so only he and the checker from Team B can read it.

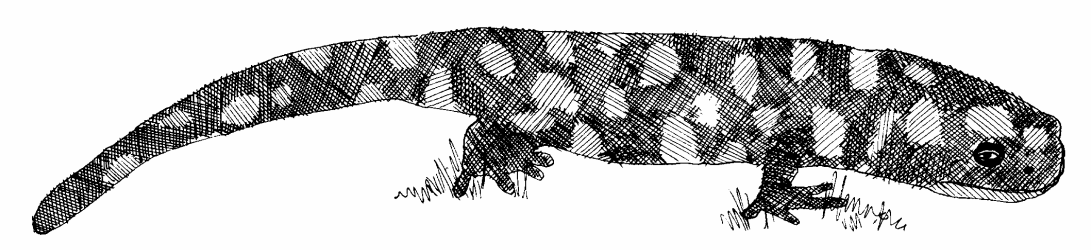
4. The object of the game is for the clue-giver to describe the "guess" word on the very top of the card without saying any of the "taboo" words or phrases printed below. No parts of the "guess or taboo" words are allowed. No rhyming words can be given. No hand motions or sound effects can be added. If the clue-giver says one of the taboo words, the checker from Team B can say "taboo". Then a new card is turned over.

5. Each time Team A figures out the "guess" word, the team scores a point and a new card is turned over. This continues until time runs out. If the clue-giver says a "taboo" word or passes a card and goes on to the next, the team loses a point.

6. When the 75 seconds runs out, the unfinished card does not count in the scoring. Switch the cards to Team B and begin again.

7. Let the students make up their own taboo cards to increase the playing time.

Teachers note: Students should play in-groups up to three per team. Photocopy enough sets of taboo cards so four or five games of taboo are being played in small groups.



NATIVE	MIGRATE	COYOTE	WOLF	SONGBIRD
Species	North	Wolf	Dog	Warbler
Resident	South	Dog	Predator	Cowbird
Alien	Birds	Predator	Community	Nest
Cattails	Fly	Community	Coyote	Flies
Threatened	Winter	Fox	Fox	Sing
Cottonwood	Marram Grass	Potawatomi	FUR TRADER	TURKEY
Tree	Dune	People	French	Thanksgiving
Beach	Beach	Beaver	Beaver	Bird
Marram Grass	Sand	Hunters	Trapper	Large
Dune	Lake Michigan	Tribe	Voyager	Eat
Sand	Plant	Indian	Canoe	Stuffing
REDWING	Indiana Dunes	Karner Blue	Researcher	WEST BEACH
Blackbird	National	Butterfly	Scientist	Park
Cattail	Lakeshore	Endangered	Ranger	Lakeshore
Marsh	Park	Lupine	Studies	Indiana Dunes
Territory	Field Trip	Insect	Observes	Sand
Bird	Hike	Extinct	Investigates	Hike
LUPINE	BLACK OAK	NEEDLES	LEAVES	SAND
Karner Blue	Forest	Jack Pine	Autumn	Indiana Dunes
Butterfly	Tree	Bundle	Fall	Beach
Endangered	Acorn	Two	Tree	Lake Michigan
Forest Fire	Leaves	Beach	Plant	Rock
Flower	Squirrels	Bearberry	Bark	Hill
SHELTER	NEST	PLANTS	ANIMALS	Environment
Den	Home	Flowers	Living	Outside
Nest	Den	Grass	Bugs	Habitat
Space	Habitat	Trees	Mammals	Animals
Habitat	Shelter	Grows	Walks	Plants
Hole	Birds	Green	Alive	Living
FLOWERS	TRAIL	DEN	SAND	Karner Blue
Plant	Hike	Bear	Dunes	Butterfly
Leaves	Step	Home	Clay	Endangered
Butterfly	West Beach	Nest	Soil	Fires
Lupine	Boardwalk	Fox	Paper	Lupine
Bloom	Field Trip	Shelter	Beach	Caterpillar

TURTLE	POLLUTION	COWBIRD	BIRDS	DEER
Shell	Air	Prairie	Migrate	Paths
Home	Water	Parasite	Resident	Mammal
Slow	Soil	Nest	Songs	Antlers
Animal	Toxic	Warbler	Feathers	Horns
Reptile	Dirty	Songbird	Nests	Bambi
DUNES	ADAPTATION	CATTAIL	RANGER	BUS DRIVER
Sand	Structure	Plant	Smokey bear	Yellow
Hill	Animal	Swamp	Flat hat	School
Lake	Plant	Marsh	Uniform	Road
Indiana	Special	Brown	Badge	Pickup
Glacier	Change	Furry	Park	Gasoline
TEACHER	RACCOON	BEAVER	WATER	FOOD CHAIN
School	Mask	Otter	Wet	Eat
Grade	Wash	Canal	Rain	Animal
Principal	Animal	Fish	Dry	Plant
Class	Night	Muskrat	Drink	Food web
Homework	Crayfish	Water	River	Pyramid
FIRE	Endangered	ALIEN	COMMUNITY	HABITAT
Burn	Species	Introduced	Habitat	Food
Hot	Karner blue	Problem	Animals	Environment
Flames	Extinct	Native	Environment	Home
Smoke	Threatened	Species	Group	Shelter
Water	Rare	Pest	Plants	Water
PREDATOR	LITTER	Woodpecker	SWAMP	MAMMALS
Prey	Kills	Bird	Water	Fur
Kill	Trash	Tree	Cattails	Hair
Eat	Pollutes	Hammer	Marsh	Milk
Hunt	Garbage	Insects	Birds	Animals
Animal	Dump	Bill	Insects	Humans
FROGS	EXTINCT	JACK PINE	BEACH	OAK FOREST
Amphibians	Gone	Community	Sand	Trees
Croak	Habitat loss	Cones	Dunes	Acorns
Chorus	Endangered	Bearberry	Community	Dogwood
Green	Species	Community	Lake Michigan	Community
Toad	Destroyed	Needles	Waves	Leaves

GLOSSARY

Adaptation - A special part of a plant or animal that helps it survive.
Alien - A plant or animal from another continent or part of North America that was not native to Indiana Dunes.
Baseline study - The first scientific study or inventory that all other studies will be compared to.
Canopy - The top layer of branches and leaves in a forest, which is directly exposed to the sunlight.
Community - The plants and animals that thrive together in a specific area**.**
Critical Resource Issue - A threat to the park's plant and animal resources that is so critical some action needs to be taken immediately.
Exotic - Another term for an alien species.
Habitat - The area where a plant or animal gets its food, water, shelter, and space.
Habitat Destruction - Man's activities that remove the space plants and animals need to survive.
Parasite - In the case of Cowbirds, laying eggs in other species nests so those birds expend the energy to raise the young.
Prescribed burn - A forest fire, started by the park's fire team, that is controlled and will prevent damage to the property of the park's neighbors. A prescribed fire is use to control the growth of woody plants, returns nutrients to the soil, and increases sunlight to low growing plants like lupine.
Species - All the individuals in a population that can breed and produce fertile young.
Territory - The space defended by a male bird which provides the food and nesting site for his mate and young.
Understory - Small trees, bushes and plants that grow under the canopy of a forest.